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## Predictor-based Taxonomy of Navy Ratings: A Preliminary Study

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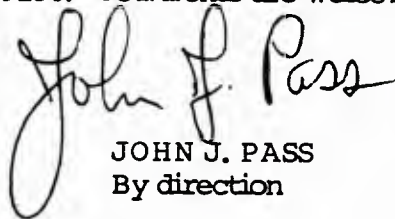
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1. This research and development was conducted within the exploratory development project RF63-521-804 (Manpower and Personnel Technology), work unit 040-03.01 (Dimensions of Job Performance). The purpose of the work unit is to define general dimensions that describe the global construct of human performance at work and to identify measures of such dimensions. Such dimensions will provide a framework for estimating how effective a single measure may be in predicting job performance. This exploratory development was conducted under contract DAAG 29-81-D-0100, delivery order 2065.

2. Enclosure (1) is the sixth in a series produced under this work unit. The previous reports described: 1) factors that made it inappropriate to try to use personnel record data to develop a surrogate measure of job performance that would generalize across ratings and grades; 2) a model of the principal dimensions that comprise human performance at work; 3) a model of specific work-related social interactions and the factors affecting such interactions; 4) the results of a task analysis demonstrating the contribution that the inclusion of social interactions makes to job analysis; and the results of developing and applying a developmental theory of job performance.

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**Predictor-based Taxonomy of Navy Ratings:  
A Preliminary Study**

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## SUMMARY

### Problem

Selection and classification of recruits is currently done on the basis of the cognitive abilities measured by the Armed Services Vocational Aptitude Battery (ASVAB). There is a need for a more broadly based system that considers a range of variables in addition to general cognitive ability. A first step toward achieving this end is to develop a taxonomy that classifies Navy ratings on the basis of the variables that are most likely to predict job performance. Such a taxonomy would be particularly useful for interpreting research on the ASVAB, as well as research on the validity and utility of the experimental tests that are currently being developed by the Navy and other services.

### Purpose

The purpose of this research is to develop and apply a method of classifying Navy ratings on the basis of the variables that predict successful performance on the job. The research described here comprised five separate activities: (1) determining appropriate dimensions for classifying the set of relevant and practical predictors (job requirement dimensions), (2) selecting a representative sample of ratings for study, (3) collecting job requirement data using multiple methods, (4) assessing the convergence between data collected using different methods, and (5) classifying ratings.

### Approach

Five job requirement dimensions were defined that showed sufficient breadth and relevance to serve as a basis for classifying Navy ratings. These dimensions were: (1) cognitive ability, (2) psychomotor ability, (3) information-processing ability, (4) training, and (5) experience.

Four methods were then used to assess the usefulness of each of these dimensions in predicting job performance: (1) Occupational Ability Pattern analysis, in which information is obtained from the Dictionary of Occupational Titles regarding ability and training requirements for jobs; (2) Expert Judgment, in which Chiefs (E-7, E-8, E-9) in the ratings studied served as subject-matter experts; (3) Validation Research, which involves accumulating results over several validity studies to estimate the usefulness of different predictors in groups of ratings, and (4) Task Analysis of each of the ratings studied. The convergence between these four methods was assessed, and a rating taxonomy was developed on the basis of data from the measurement methods that showed the most convergence.

### Results

Data obtained from Expert Judgment, Validation Research, and Task Analysis showed significant agreement regarding the usefulness of the five job requirement dimensions for predicting performance in a sample of 18 ratings that are broadly representative of Navy activities; data from Occupational Ability Pattern analysis showed less agreement. On the basis of Expert Judgment data, the ratings were classified into three groups: (1) cognitive group, (2) practical ability group, and (3) training group. In the cognitive group, general cognitive ability was seen as the major determinant of job success. The practical ability group emphasized perceptual-motor, problem-solving, and information-processing skills. Finally, the training group emphasized performance in training, and de-emphasized cognitive and perceptual abilities as determinants of job success.

## Conclusions

Expert judgment provides a practical and valid method of obtaining job requirement data. These data, in turn, can be used to form a predictor-based taxonomy of Navy ratings. This taxonomy suggest that some tests, particularly those that measure perceptual-motor, problem-solving and information-processing skills, will be significantly more useful in some ratings than in others. Thus, the results of validity studies for this class of test could depend on the sample of ratings included in the study.

## Recommendations

The method developed here provides a practical basis for grouping Navy ratings, and the resulting taxonomy appears to have implications for the design and evaluation of selection and placement systems. The first recommendation is that the methods developed here be applied to the remaining ratings in the Navy. This will allow assessment of the validity and generalizability of the taxonomy that has been developed in the current sample of ratings. Second, the taxonomy leads to different tests in different groups of ratings. As job performance measures are developed in these ratings, the validity of these predictions should be assessed. Additional, more specific recommendations are presented.

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## INTRODUCTION

### Problem

Many of the major personnel functions, including personnel selection, placement, and training, depend in part on a knowledge of the variables that are related to successful performance. There is extensive evidence that individual differences in cognitive ability are related to job performance. There is also evidence that abilities outside of the traditional cognitive domain, including psychomotor abilities and information-processing abilities, predict job performance (Fleishman & Quaintance, 1984). Although general intelligence is thought to be related to performance in practically all jobs (Schmidt & Hunter, 1981), it is not clear whether all cognitive and noncognitive abilities are equally relevant for predicting performance on different jobs. The use of ability tests, such as the Armed Services Vocational Aptitude Battery (ASVAB), in classification is based on the assumption that different abilities, aptitudes, and skills are needed in different jobs (Cronbach & Snow, 1977).

Although it is likely that different jobs do require different abilities and skills, it is unlikely that each job is totally different in its requirement from every other job. It is more likely that jobs can be grouped on the basis of their ability and skill requirements (Pearlman, 1980). Such a taxonomy would be useful for several purposes, especially in the design and validation of personnel selection and placement systems. For example, considerable attention has recently been given to the development of computerized tests of spatial and perceptual abilities. It is unlikely that these tests will be useful in predicting performance in all Navy ratings, but at present, no systematic method exists for predicting in which ratings such spatial and perceptual tests will or will not be useful. There is a need for a broad-based taxonomy of Navy ratings that groups ratings according to their ability and skill requirements, and that considers abilities and personal characteristics in addition to those covered by traditional tests of cognitive ability.

Although the rating serves as the unit of analysis for this research, the skills, abilities, etc. required to perform successfully in that rating are referred to as the job requirements. Since "rating" and "job" are not synonymous, this usage is somewhat imprecise. There are, however, several reasons to prefer the term "job requirements" to terms such as "requirements of the rating." First, ratings consist of groups of highly similar jobs. Thus, one can argue that job requirements of the most general sort are rating requirements. Second, the term "job requirements" is widely used and understood, whereas the term "rating" has a special meaning that is particular for the Navy. Throughout this report, the term "job requirement" is used to represent skills, abilities, knowledge, or experiences needed to perform successfully in most of the jobs that comprise a particular rating.

### Purpose

The purpose of the research described in this report is to develop a practical method for classifying Navy ratings on the basis of common job requirements. The focus of the present study is on job requirements for enlisted personnel below the grade of Chief Petty Officer.

A taxonomy based on job requirements would be useful in several ways. First, as noted earlier, such a taxonomy would provide a basis for predicting the validity of new tests and would provide guidance in designing validity studies. For example, the validity of tests of specific abilities (e.g., spatial ability) may vary systematically across ratings.

A taxonomy based on job requirements would help indicate in which ratings high or low validity coefficients might be expected. Second, such a taxonomy might be useful in evaluating requests for transfer from one rating to another. The outcome of transfers between ratings that share common job requirements should be more predictable than transfers that involve fundamental changes in job requirements.

The method described in this report involves grouping ratings on the basis of the variables most likely to predict successful performance in the jobs that comprise a rating. Thus, the domain of this taxonomy is potentially broader than the domain of aptitude and skill requirements. In particular, the taxonomy constructed here considered broad dimensions such as performance in training and previous job experience as well as traditional cognitive and psychomotor ability dimensions. This taxonomy did not consider other predictors, such as personality, interests, motivation, or life history measures for reasons that are discussed later. The inclusion of training and experience dimensions as well as ability dimensions allowed us to discriminate between three types of ratings: (1) those in which traditional cognitive abilities are the most important determinant of success, (2) those in which selected abilities that are not highly related to general mental ability (e.g., perceptual motor abilities) are important determinants of success, and (3) those in which individual differences in ability are not seen as major determinants of success.

## METHOD

Although several methods exist for developing job taxonomies (Fleishman & Quaintance, 1984), none of these methods is entirely adequate for the task at hand. A major task in the present study was therefore to develop a practical method for forming a predictor-based taxonomy of Navy ratings. To accomplish this end, several different methods of data collection and of defining and establishing job requirements were assessed using a limited sample of Navy ratings. Thus, the present study entailed five steps: (1) determining dimensions for describing job requirements, (2) selecting a sample of ratings for study, (3) establishing job requirements, using multiple methods, in each rating, (4) assessing convergence between methods, and (5) classifying ratings on the basis of job requirements.

### Determining Job Requirements Dimensions

Job requirements could be phrased in terms ranging from the most general (e.g., good attitude required) to the most specific (e.g., ability to operate specific piece of equipment required). In defining job requirement dimensions, four factors were considered. First, dimensions should be sufficiently broad to apply to several different ratings. Thus, ability to perform specific tasks or to operate specific equipment were not considered in forming a rating taxonomy. Second, dimensions should be sufficiently broad to be assessed by several different methods. Thus, job requirement dimensions that were unique to a single method of measurement (e.g., choice reaction time, criterion-keyed biodata blanks) were not included in the taxonomy. Third, we considered the "track record" of different job requirement dimensions. Only those dimensions that had been clearly shown in the research literature to be related to job performance were included in the development of the rating taxonomy. Finally, the application potential of different job dimensions was considered. For example, it is conceivable that several physiological measures are related to performance in some jobs, but it is doubtful that the technology exists to take advantage, on any large scale, of this relationship. Similarly, there is some evidence that personality variables and interests are related to performance in some jobs, but the

research evidence is inconsistent and generally unencouraging (Schmitt, Gooding, Noe, & Kirsch, 1984); the application potential of these tests is therefore in doubt. Only those dimensions that could be reliably and economically measured and that presented clear application potential were including the taxonomy.

The criteria listed above led us to eliminate several theoretically interesting dimensions such as personality, interests, or social skills. Since this report deals with a predictor-based taxonomy; these dimensions were eliminated.

Five job requirement dimensions were selected to form the basis of the rating taxonomy. They are:

1. Cognitive ability: General intelligence and closely related verbal, mathematical, and reasoning abilities .
2. Psychomotor ability: Abilities related to visualization, spatial orientation, and precision of motor responses.
3. Information-processing ability: Abilities involving basic information processing activities, such as selective attention or time sharing
4. Training: Performance in structured job training activities.
5. Experience: Previous work history, as well as life history data that are related to job performance.

#### Selecting a Sample of Ratings

Rather than apply several experimental methods to all of the ratings in the Navy, we selected a sample of approximately one-fifth of the current ratings for detailed study. Several factors were considered in selecting ratings. First, for practical reasons, we wished to study ratings in which there were large numbers of incumbents centrally located. Second, we wished to cover several major job families by sampling ratings that involved clerical work, bench work, structural work, information-processing work, and work with people. In addition, we wished to cover jobs that were widely representative of Navy activities at ship-based, land-based, and aviation-related sites. These considerations led to the selection of the 18 ratings listed in Table 1 as the focus of our study.

#### Establishing Job Requirements

Review of research in personnel selection and classification (c.f. Fleishman, 1975; Fleishman & Quaintance, 1984) suggests that several methods are commonly used to establish the extent to which each of the job requirement dimensions described earlier are related to successful performance in different ratings. Four of these methods were used in this study: (1) occupational ability pattern analysis, (2) expert judgment, (3) validation research, and (4) task analysis.<sup>1</sup> Expert judgment required field interviews

---

<sup>1</sup>Additional methods for determining job requirements include worker-oriented job analysis questionnaires (Fine, 1955; McCormick, Jeanneret, & Mecham, 1972) and trait-oriented methods (Lopez, Kesselman, & Lopez, 1981; Primoff, 1974). Each of these methods requires supervisors or job experts to respond to extensive questionnaires or inventories, and was judged impractical for the current project.



with subject-matter experts; the other three methods were archival, in the sense that they involved synthesis of data that had already been collected for other purposes.

**Table 1**  
Eighteen Ratings Selected for Study

---

AC	Air Traffic Controller
AM	Aviation Structural Mechanic
AQ	Aviation Fire Control Technician
AZ	Aviation Maintenance Administrationman
BM	Boatswain's Mate
CT	Cryptologist Technician
DS	Data Systems Technician
EM	Electrician's Mate
ET	Electronics Technician
HM	Hospital Corpsman
IS	Intelligence Specialist
MA	Master at Arms
MM	Machinists Mate
PC	Postal Clerk
RM	Radioman
SH	Ship's Serviceman
ST	Sonar Technician

---

#### Occupational Ability Pattern Analysis

This first strategy for establishing job requirements takes advantage of the extensive research on the ability and training requirements for civilian jobs that is catalogued in the Dictionary of Occupational Titles (DOT). In addition to job descriptions, the provides DOT estimates of the extent to which each of the 11 abilities measured by the General Aptitude Test Battery (GATB) are required for each of several thousand civilian jobs (Field & Field, 1977). These GATB profiles form what will be referred to here as occupational ability patterns.

The method of occupational ability pattern analysis involves matching Navy ratings to civilian equivalents that are described in the DOT. This was achieved by using the Military Occupational an Training Data (MOTD) manual, which lists civilian equivalents (by DOT number) for most of the occupations in the services. Using the MOTD (1985), we were able to identify civilian equivalents for 17 of the 18 ratings studied; there is no

civilian equivalent for Sonar Technician. For several ratings, more than one civilian equivalent could be identified. For example, five different civilian jobs were identified as equivalent to the rating Master at Arms; these are listed in Table 2. The number of civilian equivalents identified for the 17 ratings ranged from one to eight; an average of four civilian equivalents was identified for each Navy rating.

**Table 2**  
Civilian Equivalents to Master at Arms

Civilian Equivalents	DOT #
Guard, Security	372667034
Merchant Patroller	372667038
Police Officer I	375263014
State Highway Police Officer	375263018
Sheriff, Deputy	377263010

In addition to GATB ability requirements, estimates of the level of reasoning, mathematical, language, and specific vocational training required in each civilian job were obtained from the DOT. For the 15 ratings in which more than one civilian equivalent was identified, GATB scores and training requirement scores were pooled over all civilian equivalents by taking the mode of each of the ability and training scores to form an occupational ability profile for that rating. Thus, the ability profile for the rating Master at Arms is an average of the ability profiles for the five civilian jobs listed in Table 2.<sup>2</sup>

Occupational ability patterns for the 17 ratings are listed in Table 3. GATB ability requirements and training requirements are scored on a scale from 1 to 5, where a high score indicates that a high level of that ability is required on the job; an exception is specific vocational training requirements, which were scored on a nine-point scale.

#### Expert Judgment

The second method used to determine job requirements involved the use of subject-matter experts. Specifically, several chiefs (E-7, E-8, or E-9) in each of the 18 ratings were asked to judge the importance of several abilities, as well as experience and training, in determining successful performance on the job. To avoid inflation that often accompanies self-ratings, chiefs were asked to rate the abilities and experiences necessary for successful performance at the E-4 and E-5 level (Petty Officer, 3rd and 2nd class) in their ratings. Chiefs were qualified to serve as experts in judging the determinants and performance at this level for two reasons: (1) all chiefs have served at the E-4 and E-5 level in their rating, and (2) most chiefs supervise the work of E-4s and E-5s.

---

<sup>2</sup>The mode was used rather than the mean or median because of the highly skewed distributions typically found in these data.



**Table 3**

Occupational Ability Patterns for 17 Navy Ratings

	Rating																
	AC	AM	AQ	AZ	BM	CT	DS	EM	ET	HM	IS	MA	MM	MT	PC	RM	SH
<u>GATB Abilities</u>																	
Intelligence	4	3	3	3	3	4	4	3	3	4	4	3	3	3	3	3	3
Verbal ability	3	3	3	3	2	3	3	3	3	3	4	3	3	3	3	3	2
Numerical ability	3	3	3	3	2	3	3	3	3	3	4	2	3	3	3	3	2
Spatial ability	2	4	3	2	3	3	4	4	3	3	3	2	4	3	2	3	2
Form perception	3	4	2	3	3	3	4	3	4	3	3	3	4	2	3	3	2
Clerical perception	3	2	2	4	2	3	2	2	2	3	3	2	2	2	4	3	3
Motor coordination	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	3	3
Finger dexterity	2	3	3	3	2	2	3	3	3	3	2	2	3	3	3	4	2
Manual dexterity	2	4	3	3	3	2	4	3	4	3	2	3	3	3	3	3	2
Eye-hand-foot coordination	2	2	2	1	3	1	1	1	1	2	1	3	1	2	1	1	1
Color discrimination	3	1	2	1	2	2	2	3	3	2	2	1	1	2	1	1	2
<u>Training Required</u>																	
Reasoning	5	4	4	3	3	4	4	4	4	4	5	3	4	4	4	4	3
Mathematical	4	3	4	2	2	4	4	3	4	4	4	2	4	4	2	3	3
Language	4	3	4	3	2	4	4	3	3	4	4	3	3	4	3	4	2
Specific vocational training	8	7	6	4	5	7	6	7	7	6	7	4	7	6	4	7	4

Expert judgments were obtained in field interviews conducted in Norfolk, VA and San Diego, CA. Sample sizes for the two locations are listed in Table 4. With the exception of the AQ rating, we were able to interview a minimum of four chiefs in each rating. We interviewed chiefs in both Norfolk and San Diego in two ratings (AC and MA) to assess the similarity in responses obtained in the two coasts. In general, the ability profiles obtained from the two coasts for these ratings were sufficiently similar to be pooled into a single profile for each rating. That is within ratings, there were no significant differences between the Norfolk and San Diego samples in any of the judgmental indices obtained from subject-matter experts.

**Table 4**  
Expert Judgment Sample

Rating	Norfolk	San Diego	Total
AC	5	7	12
AM	-	6	6
AQ	-	2	2
AZ	5	-	5
BM	-	6	6
CT	-	6	6
DS	4	-	4
EM	4	-	4
ET	4	-	4
HM	6	-	6
IS	-	5	5
MA	4	3	7
MM	5	-	5
MT	5	-	5
PC	5	-	5
RM	-	8	8
SH	-	6	6
ST	-	5	5

In addition to unstructured interviews, chiefs responded to two questionnaires designed to assess the extent to which general ability, specific cognitive and psychomotor abilities, experience, and training contribute to successful performance. The first questionnaire asked them to indicate the importance of 21 abilities taken from the Fleishman taxonomy (Fleishman & Quaintance, 1984), using a five-point Likert-type scale.

High scores indicate that the ability is important. The second questionnaire presented a policy capturing task, in which subjects judged the likelihood of success of hypothetical individuals who were described in terms of their intelligence, performance in training, experience, and psychomotor ability. Cue values were normally distributed and mutually orthogonal, allowing us to determine the independent impact of each of the four cues on overall judgment. In particular, the correlation between the values of each cue and subjects' judgment of the 50 profiles served as an index of the relative importance of that cue in judging the profiles. The larger the correlation between a particular cue (e.g., intelligence) and judgments, the more important that cue was in subjects' judgments regarding probable success on the job. The two questionnaires used to obtain expert judgments are presented in Appendices A and B.

In summary, each expert provided estimates of the importance of 21 abilities; policy capturing indices of the importance of intelligence, training, experience, and psychomotor ability were also obtained for each expert. These data were obtained from 2 to 12 experts in each rating within each rating; these scores were pooled across experts to form an unweighted average expert judgment profile for each of the 18 ratings included in this study. Average expert judgments profiles for each rating are presented in Table 5.

### Validation Research

The third method used to determine job requirements involved a review of recent validation research. Although research in validity generalization suggest that much of the variability in the validity of cognitive ability tests is artifactual, there is reason to believe that: (1) there is some systematic variability in the validity of different types of predictors within job families, (2) there is systematic variability in the validity of different predictors across job families, and (3) differences in the validity of predictors reflect in part the relative importance of different abilities in determining job performance (see Fleishman, 1975; Ghiselli, 1966; Gutenberg, Arvey, Osburn, & Jeanneret, 1983; Hunter & Hunter, 1984). For example, if general intelligence is important in job A and less important in job B, we should expect that cognitive ability tests will show higher levels of validity in job A than in job B.

Because research on paper and pencil cognitive ability tests has been reviewed extensively in the validity generalization literature, our review concentrated on validity studies that examined alternatives to paper-and-pencil tests. We classified the results of these validity studies according to two criteria, predictor type and job family. The predictors reviewed were: (1) cognitive ability tests, (2) physical and psychomotor ability tests, (3) training measures, (4) work history measures, and (5) life history (biodata) measures. Note that these five classes of predictors were similar but not identical to the five dimensions chosen to form a basis for the taxonomy. These five dimensions correspond to those most often used in classifying validation studies. Validation results were also classified according to six of the major job families included in the DOT: (1) professional, technical, and managerial, (2) clerical and sales, (3) service occupations, (4) machine trade occupations, (5) structural work occupations, and (6) miscellaneous occupations. Some of the cells of the 5 x 6 predictor type x job family table contained more than one validity coefficient; unweighted mean validity coefficients were computed (using Fisher's transformation) for each cell with multiple entries. The results of our review, classified by predictor type and job family, are presented in Table 6.

We were able to sort the civilian equivalent of the 17 Navy ratings into one or more of the job families listed in Table 6, and thus were able to obtain estimates of the validity of these five classes of tests in predicting performance in each rating. Where civilian

Table 5  
Mean Expert Judgments by Rating

	Rating																	
	AC	AM	AQ	AZ	BM	CT	DS	EM	ET	HM	IS	MA	MM	MT	PT	RM	SH	ST
<u>Abilities from Fleishman</u>																		
<u>Taxonomy</u>																		
Oral comprehension	5.0	3.8	3.5	4.4	4.5	4.1	3.7	3.0	3.5	4.1	4.4	4.2	3.6	4.4	4.4	4.1	3.5	4.0
Written comprehension	4.2	3.6	4.0	4.6	3.8	4.0	4.7	3.7	4.2	4.5	4.2	4.4	3.8	4.4	4.4	4.4	3.8	4.2
Oral expression	4.9	3.6	3.5	3.6	4.6	4.1	3.5	3.7	3.7	4.0	3.8	4.4	4.0	3.8	4.2	3.5	4.0	4.2
Written expression	3.0	3.5	3.0	3.0	3.1	4.1	3.5	3.0	3.2	3.8	3.6	4.4	3.8	3.2	3.8	3.1	3.8	3.6
Memorization	4.8	3.3	4.0	3.8	3.8	4.6	4.0	3.5	4.5	4.1	4.0	4.0	4.8	4.2	4.2	4.0	3.6	4.8
Problem sensitivity	4.6	4.1	4.0	2.8	4.5	4.0	4.7	4.2	4.2	3.8	3.4	3.7	4.8	4.6	4.0	4.0	3.3	4.8
Mathematical reasoning	2.2	2.5	4.5	2.0	3.1	2.1	4.5	2.2	4.0	2.6	3.6	1.7	2.2	2.2	3.6	1.2	2.8	3.8
Number facility	2.3	2.1	4.5	3.2	2.6	1.6	3.7	2.0	3.7	2.3	3.6	1.5	2.2	2.0	4.6	1.6	4.6	4.0
Deductive reasoning	4.3	3.1	5.0	2.8	4.0	3.8	4.7	4.0	4.5	2.8	3.4	3.8	4.0	4.4	2.8	3.3	3.5	4.4
Inductive reasoning	3.7	3.3	5.0	3.4	4.1	3.8	4.5	3.5	4.2	3.6	3.6	4.0	4.0	3.6	3.2	3.6	3.5	4.4
Speed of closure	4.6	3.1	3.0	1.6	4.0	3.6	3.7	2.0	4.2	3.5	3.4	3.4	2.8	3.4	3.2	2.6	2.1	4.4
Flexibility of closure	3.4	3.6	3.5	2.4	3.0	3.5	3.2	2.2	3.5	2.8	3.6	3.2	2.0	2.8	2.6	2.3	2.8	3.8
Spatial orientation	4.2	3.5	2.5	1.4	4.5	2.6	2.2	1.2	3.0	2.5	3.6	3.1	3.2	2.8	2.2	1.3	2.5	3.6
Visualization	3.7	4.0	3.5	1.6	3.1	1.8	3.0	2.0	2.7	2.1	3.4	3.4	3.8	3.6	2.2	1.6	3.5	3.2
Perceptual speed	3.1	4.0	3.5	2.2	3.5	3.1	3.0	1.7	3.7	3.0	4.2	3.4	3.6	3.4	2.6	3.5	3.5	4.6
Control precision	3.0	3.6	5.0	1.6	4.1	3.0	2.5	2.5	3.5	2.6	2.0	3.1	4.2	4.6	2.6	3.2	2.6	4.0
Selective attention	4.5	4.1	5.0	4.0	4.1	4.6	3.0	3.5	4.0	3.6	3.5	3.2	4.2	4.8	4.2	4.3	3.0	4.0
Time sharing	4.7	4.0	4.0	3.8	3.5	4.6	3.7	3.0	4.0	4.0	3.5	3.7	4.0	4.2	4.4	4.2	3.0	4.0
Auditory attention	4.8	2.6	3.0	3.6	4.0	4.8	2.7	1.7	3.5	3.3	2.2	3.2	3.8	4.4	2.6	3.2	2.8	4.8
Speech hearing	4.8	3.6	3.0	3.0	4.1	3.6	2.5	2.5	3.2	4.0	3.0	3.0	4.0	2.6	3.0	3.2	4.0	3.6
Speech clarity	4.9	3.8	3.0	4.0	4.3	3.6	3.5	3.0	3.7	4.0	4.2	4.8	4.6	4.0	4.4	3.8	3.6	3.8
<u>Policy Capturing Indices</u>																		
Intelligence	.17	.22	.27	.49	.15	.48	.45	.30	.35	.35	.47	.27	.17	.18	.38	.34	.31	.24
Training	.31	.35	.37	.32	.37	.39	.41	.50	.47	.47	.40	.29	.40	.38	.42	.40	.45	.44
Experience	.22	.32	.32	.25	.20	.15	.14	.25	.18	.18	.16	.26	.32	.20	.20	.23	.26	.25
Perceptual/motor skills	.50	.38	.38	.09	.51	.19	.20	.22	.28	.28	.09	.28	.38	.47	.16	.24	.15	.43

**Table 6**

Estimated Validity of Five Classes of Predictors  
in Six Job Families<sup>a</sup>

Job Family	Cognitive Ability	Physical Ability	Training Measures	Work History	Life History
Professional					
Technical, managerial	.48	.26	.15	.15	.31
Clerical and sales	.43	.25	.13	.14	.51
Service occupation	.33	.26	.13	.14	.32
Machine trade occupation	.45	.34	.11	.11	.13
Structural work occupations	.37	.40	.13	.14	.32
Miscellaneous occupations	.30	.44	.13	.14	.32

<sup>a</sup> Articles included in review were Ash and Levine (1985); Gordon and Kleinman (1976); Hough, Keyes, and Dunnette (1983); Hunter and Hunter (1984); Latham and Saari (1984); Love (1981); Mount, Muchinsky, and Hanser (1977); Reilly and Chao (1982); and Schmidt, Hunter, and Pearlman (1981). Several of these studies were in turn reviews of current research.

equivalents of a particular rating could be matched to multiple job families (e.g., clerical and service occupations), we computed the unweighted means of the validity coefficients from those families to represent the estimated validity of each test type for that rating.

### Task Analysis

Task analysis data were obtained from two sources. First, detailed task analyses were provided for each rating by the Navy Occupational Data Analysis (NODAC). NODAC task analyses report the frequency with which members of each rating do, supervise, and assist in performing each of up to several hundred tasks, and the frequency with which different types of equipment are used; the exact number of tasks and types of equipment varies from rating to rating. Task analysis results are reported separately for each enlisted pay grade, allowing analysts to examine in detail changes in job duties as individuals move up through the ranks. Second, higher-order task data could be obtained from the Navy Enlisted Occupational Standards. These standards describe specific responsibilities assigned to each rating; each of these standards is in turn linked to the performance of one or more of the tasks included in the detailed task analyses.

As is typical of task analysis data, the majority of the tasks and the occupational standards associated with each rating were unique to that rating. As a result very few tasks or standards were present in enough ratings to yield meaningful comparisons of the different ratings in terms of the tasks performed or the responsibilities assigned to each rating. Rather than providing a well defined list of job requirements for each rating, such as those presented in Tables 3 and 5, task analysis data were used to obtain a better understanding of each rating, and served as the basis for our initial hypotheses regarding



the dimensions that might be used to classify jobs. On the basis of task and occupational standards data for each of the 18 ratings, three general classes of ratings were hypothesized:

1. Ratings in which cognitive ability, training, and experience are emphasized as determinants of job performance.
2. Ratings in which cognitive, perceptual-motor, and information processing abilities are emphasized as determinants of job performance.
3. Ratings in which training and experience are emphasized as determinants of job performance.

### Assessing Convergence

Convergence could be assessed in two ways. First, since multiple expert judgments were obtained for each rating, inter-rater agreement could be assessed. Second, the convergence between occupational ability patterns, validity profiles, and expert judgments profiles was assessed by correlating the results of these methods across the 18 ratings studied. For example, validity studies, expert judgments and occupational ability profiles could all be used to assess the importance of general cognitive ability in each rating. By correlating estimates from each method across the 18 ratings, convergence of three methods could be assessed.

## RESULTS

### Inter-rater Agreement/Expert Judgment

Since correlation coefficients are strongly affected by irrelevant differences in the means and standard deviations of each rater's judgment, as well as differences in the covariance between cues and judgments, we did not compute inter-rater agreement statistics for the policy capturing outcomes. Inter-rater agreement for the 21 Fleishman ability dimensions was indexed in two ways. First, the extent to which the 18 ratings can be distinguished from one another on each of the 21 ability dimensions provides a measure of inter-rater agreement (Kavanaugh, MacKinney, & Wolins, 1970). By measuring the difference between ratings on each dimensions in a multi-rater multi-dimension design, it is possible to estimate the convergent validity of expert ratings. Second, a concrete index of inter-rater agreement can be obtained by computing the standard deviation, within each of the 18 ratings, for each of the 21 ability dimensions.

The data showed considerable evidence of inter-rater agreement. First, there were significant differences between the mean scores of the 18 ratings on 17 of the 21 Fleishman ability dimensions; F statistics for these 17 dimensions ranged from 1.7 to 5.0, with an average  $F$  of 2.59.<sup>3</sup> Furthermore, these differences between ratings were large relative to the variability in expert judgment within each rating. On the average, differences between ratings accounted for 32 percent of the variability in expert judgment; the average between-rating variance was 2.5 times as large as the average within-rating variance. Levels of convergent validity reported here are comparable with agreement levels reported by Borman (1978) for laboratory studies of rating accuracy.

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<sup>3</sup>No differences were found for the importance of written comprehension, written expression, memorization, or perceptual speed.

The average within-rating standard deviation was .95. This indicates that on average, experts who were evaluating the importance of each ability dimensions were consistent, in an absolute sense, in their judgments. In concrete terms, this figure indicates that in over 85 percent of all judgments, experts describing the same rating were within one scale point (a five-point scale was used) of the mean for that rating. Taken together, the inter-rater agreement data cited above suggest that experts were able to agree in their judgments regarding the ability requirements of their ratings.

### Convergence Analysis

In all, 45 separate measures were obtained that provided information regarding job requirements. Data from occupational ability analyses included for training requirement measures and 11 GATB ability requirement measures were obtained from the DOT. Our review of the validation research yielded five validity estimates for each rating. Expert's judgment data yielded 21 ability estimates and four policy capturing measures. To reduce the complexity of our analysis, composite scores were formed to summarize the 21 ability estimates obtained from experts. Separate composites were formed to summarize the 11 GATB requirement scores obtained from the DOT.

#### Composite Scores

Composite scores represented unweighted means of the ability estimates obtained from experts. Three composites accounted for over 80 percent of the variance in the 21 ability estimates. They were:

1. EXREAS: A reasoning composite made up of problem sensitivity, deductive reasoning, and inductive reasoning.
2. EXPERC: A perceptual composite made up of flexibility of closure, spatial orientation, visualization, conceptual speed, speech hearing, and speech clarity.
3. EXIP: An information processing composite made up of selective attention, time sharing, auditory attention, and speed of closure.

Three composites accounted for over 85 percent of the variance in the GATB requirement scores. They were:

1. GCOG: A cognitive composite consisting of intelligence, verbal ability, and numerical ability.
2. GPM: A perceptual-motor composite consisting of spatial ability, form perception, motor coordination, finger dexterity, and manual dexterity.
3. GIP: An information processing composite, which included only the clerical perception test.

#### Convergence Between Methods

The extent to which methods agreed was determined by correlating the data obtained from occupational ability patterns, validation research, and expert judgment over the 18 ratings. Results of this analysis are shown in Table 7; only those correlations that are significant at the .05 level are shown. On the whole, Table 7 does not indicate extensive agreement between the three methods analyzed. However, it is important to note that

Table 7

Convergence Between Methods<sup>a</sup>

	Occupational Ability Pattern			Validity Estimates					Expert Judgment Policy Capturing			
	GCOG	GPM	GIP	VCOG <sup>b</sup>	VPHYS	VTRAIN	VWHIST	VLHIST	INTEL <sup>c</sup>	TRAIN	EXPER	PERMOT
VCOG	-	-	.55									
VPHYS			-.76									
VWGUST	-	-.73	.67									
VLHIST	-	-.73	.90									
INTEL	.48	-	.54	.45	-.59	-	-	-.48				
TRAIN	-	-	-	-	-	-	-	-				
EXPER		-	-	-	-	-	-	-				
PERMOT	-	-	-.52	-.46	.70	-	-	-.67				
EXREAS	-	-	-.72	.69		-	-	-.68	.45	-	-	.62
EXPERC		-	-	-	-	-	-	-	-.55	-.38	-	.57
EXIP	-	-	-	-	-	.68	-	-	-	-	-	.45

<sup>a</sup>Nonsignificant correlations are not shown. Also, correlations between measures obtained using the same method are not shown.

<sup>b</sup>Validity estimates for cognitive test, physical and perceptual motor tests, training measures, work history, and life history measures.

<sup>c</sup>Policy capturing indices of the importance of intelligence, training, experience, and perceptual motor ability.

because of the small sample size ( $N = 18$ ), many substantial correlations failed to reach conventional levels of significance. The correlations shown in Table 7 suggest two conclusions: (1) results of the expert ability ratings and policy capturing task were more compatible with validity study outcomes than were GATB scores and (2) data from occupational ability patterns was not as consistent with data from expert judgment and validation research. These conclusions are based on several considerations. First, factor analytic research has suggested that reasoning is a central facet of general cognitive ability; the EXREAS composite was correlated with the policy capturing index of the importance and intelligence for performance, and both of these were correlated with validation research results for cognitive ability tests. Second, directly equivalent measures were obtained from the three methods that indicated the relevance of cognitive abilities (GCOG, VCOG, INTEL) and perceptual-motor abilities (GPM, VPHYS, EXPER, PERMOT). Expert ratings and validity studies agreed with regard to the importance of cognitive ability; the GATB cognitive ability measure was correlated with the policy capturing index, but not with the outcomes of validity studies. Expert judgments and validity studies also agreed with regard to the importance of perceptual and motor abilities; the GATB perceptual-motor composite was not correlated with any of the other perceptual-motor measures.

Taken together, the results shown in Table 1 suggest that data obtained from occupational ability patterns did not converge with data obtained from other methods of defining job requirements, although the GATB clerical processing test (GIP) showed convergence with several other measures. Our results suggest that the expert judgment data converge adequately with data obtained from validation research. We therefore used expert judgment data as the primary basis for grouping ratings. Once groups are formed, it is possible to determine whether the hypothesized dimensions that were identified on the basis of task analysis data are useful in grouping ratings. An affirmative answer here would indicate some level of convergence between task analysis and expert judgment data.

### Grouping Ratings

Cluster analysis was used to form groups of ratings that were homogenous with regard to the abilities and characteristics rated as most critical for successful performance on the job. For each rating, the seven measures obtained from expert judgments (three composite scores and four policy capturing measures) formed an ability requirement profile. Ratings were grouped on the basis of profile similarity, using the minimum variance method, with an euclidean distance metric. The steps in the iterative cluster solution are shown in Figure 1.

Several criteria were used in evaluating cluster solutions. First, within-cluster variance should be minimized. Second, the number of clusters should be minimized. Third, there should be no more than one outlier (cluster consisting of a single rating). Fourth, the between-cluster variance should be maximized. These criteria were met best by the three cluster solution. In particular, the three cluster solution showed the largest between-cluster variance, in relation to the within-cluster variance, of any of the solutions with seven or fewer clusters.<sup>4</sup>

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<sup>4</sup>Extracting more than seven clusters results in multiple outliers.

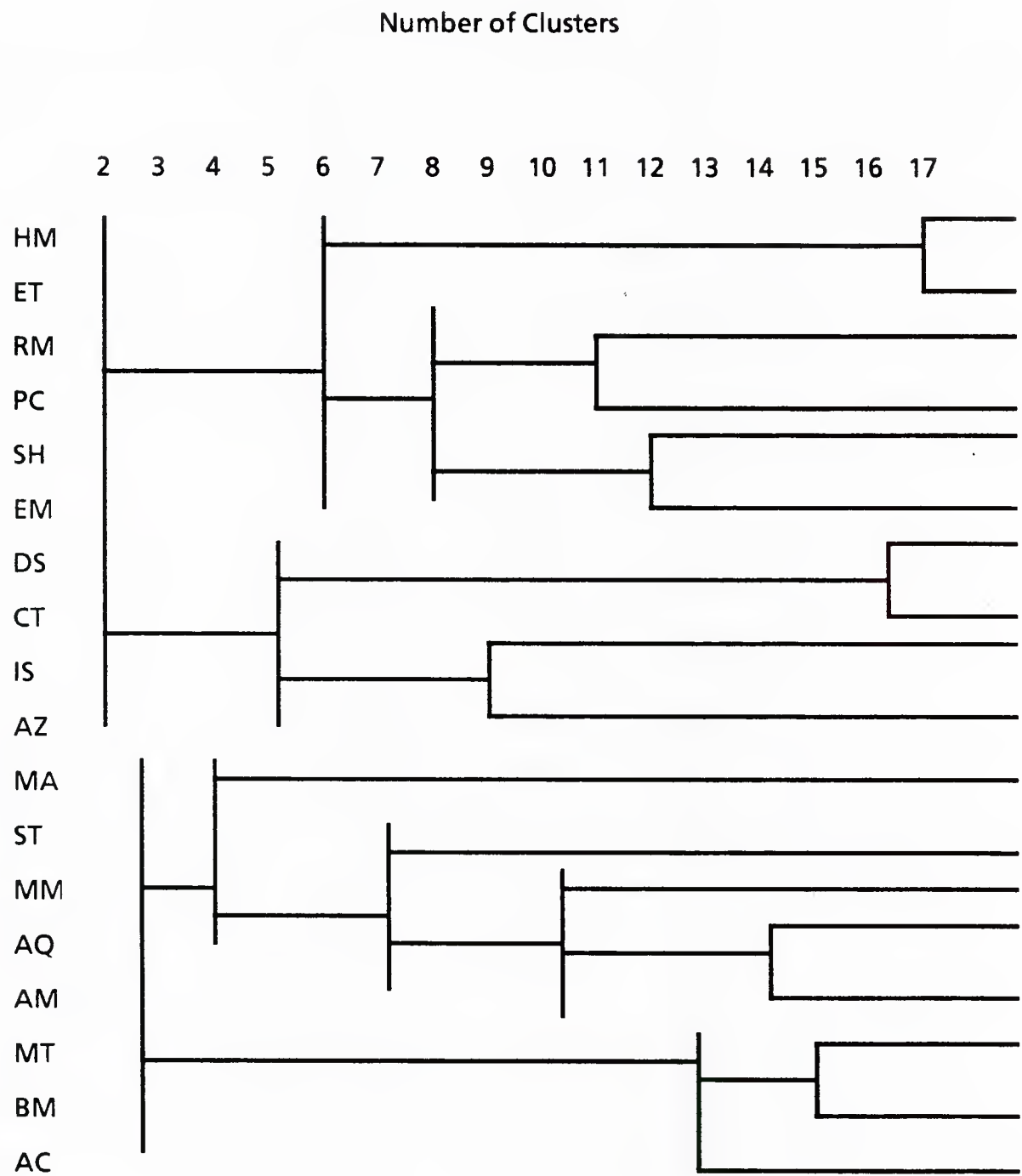


Figure 1. Iterative clustering of ratings.



The nature of these three clusters can best be illustrated by plotting the profile of scores that represent the cluster centroids (mean score on each dimension, summing over cluster members). For the purpose of comparison, scores on the seven measures used to define clusters are expressed in Z-score terms. Plots of the three cluster centroids are shown in Figure 2. The three clusters are described below:

1. Cognitive Cluster: In this group of ratings, general intelligence is seen as the most important and experience and perceptual motor skills are seen as the least important determinants of performance.

2. Practical Ability Cluster: In this group of ratings, general intelligence and training are seen as relatively unimportant; experience, perceptual motor skills, reasoning, and information processing abilities were rated as more important.

3. Training Cluster: In this group of ratings, training is seen as most important and perceptual motor and reasoning abilities are seen as the least important determinants of performance.

Cluster membership is displayed in Table 8. Cluster members are listed in order of their similarity (squared euclidean metric) to the cluster mean. Thus, Intelligence Specialist is most representative of the cognitive cluster, Machinist's Mate is the most representative of the practical ability cluster, and Hospital Corpsman is most representative of training cluster.

#### Convergence Between Expert and Task Data

As noted earlier, although task analysis data did not provide a basis for analytic comparisons of the ability requirements of the 18 ratings studied, these data did lead to hypotheses regarding the dimensions along which ratings might be grouped. Close correspondence was found between the hypothesized dimensions for classifying ratings and the actual clusters illustrated in Figure 2. First, we hypothesized that one group of ratings would emphasize cognitive ability, training, and experience. The cognitive cluster emphasized general intelligence, but placed less emphasis on training and experience than hypothesized. Second, we hypothesized that one group of ratings would emphasize cognitive, perceptual motor, and information processing abilities. The practical ability cluster emphasized perceptual motor and information processing abilities, but placed less emphasis on general intelligence than expected. Finally, we hypothesized that one cluster would emphasize training and experience. The training cluster emphasized success in training but placed less emphasis on experience than expected.

Although our hypotheses were not confirmed in all details, the general characteristics of the clusters defined on the basis of expert judgment data were highly similar to those expected on the basis of task and occupational standards data. The similarities reported here suggest that expert judgment data and task analysis data lead to consistent conclusions regarding the major dimensions for classifying Navy ratings.

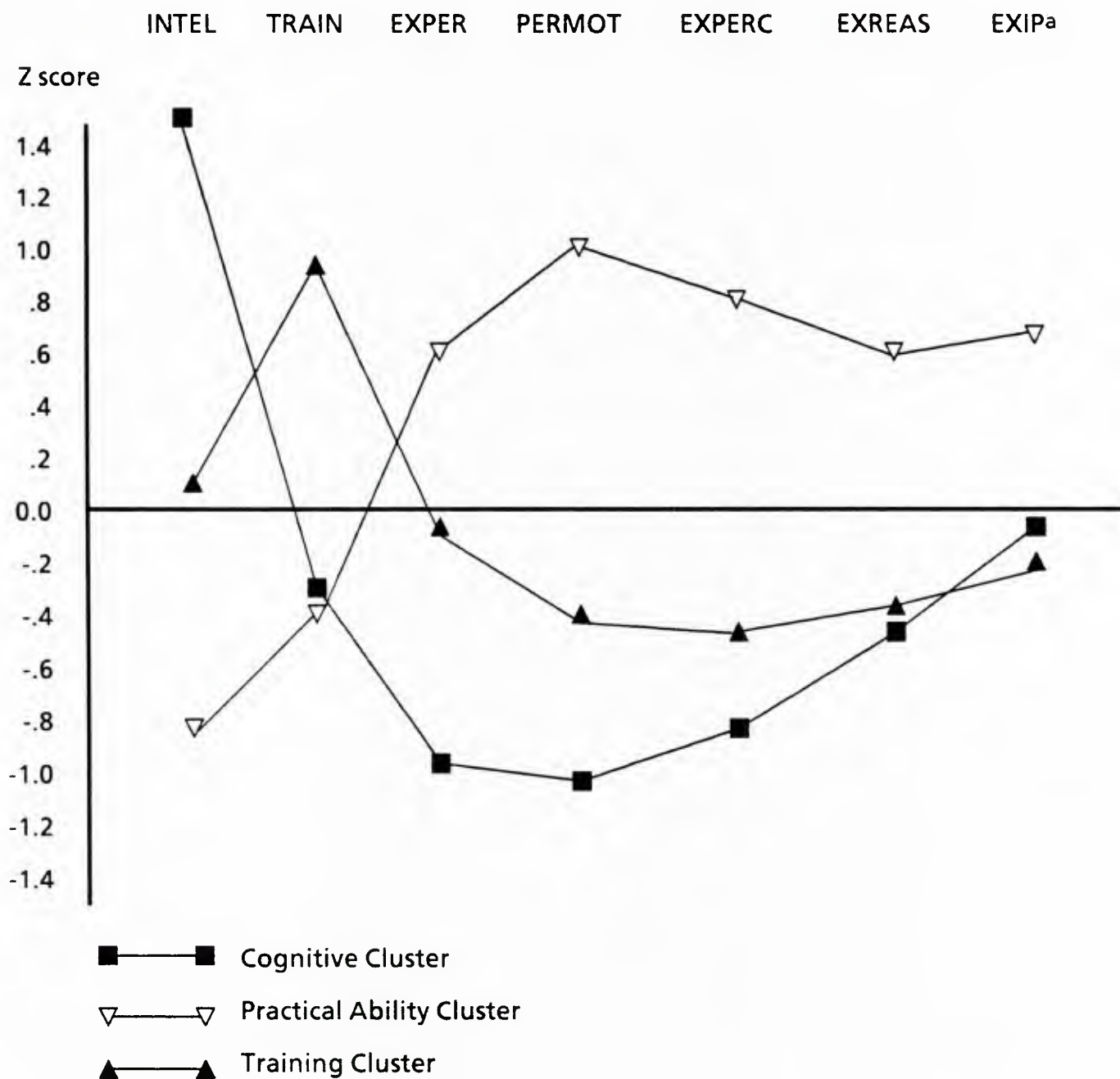


Figure 2. Three-cluster solution

<sup>a</sup>Dimensions are policy capturing indices of intelligence, training, experience, and perceptual motor ability requirements and composite ability ratings for the perceptual, reasoning, and information processing composites.

**Table 8**  
Cluster Membership as Determined by  
Expert Judgment Data

Cognitive Cluster	
IS	Intelligence Specialist
CT	Cryptologist Technician
DS	Data Systems Technician
AZ	Aviation Maintenance Administration
Practical Ability Cluster	
MM	Machinist's Mate
ST	Sonar Technician
BM	Boatswain's Mate
MT	Missile Technician
AM	Aviation Structural Mechanic
AC	Air Traffic Controller
AQ	Aviation Fire Control Technician
MA	Master at Arms
Training Cluster	
HM	Hospital Corpsman
PC	Postal Clerk
RM	Radioman
ET	Electronics Technician
SH	Ship's Serviceman
EM	Electrician's Mate

### CONCLUSIONS

1. Navy ratings can be reliably classified in terms of ability, training, and experience requirements. The abilities and skills necessary for successful performance vary from job to job, but there are groups of ratings that exhibit similar patterns of job requirements. The ratings sampled in this study were chosen to represent several major facets of the domain of all Navy ratings. It is likely, therefore, that the classification system developed here will be useful when applied to the remaining Navy ratings.

2. A predictor-based taxonomy of Navy ratings must consider both traditional and nontraditional predictors of job performance. Traditional predictors include cognitive ability tests (e.g., ASVAB) and training measures. To adequately classify ratings, nontraditional predictors such as perceptual motor and information processing tests must also be considered. Advances in computerized testing have significantly enhanced researchers' capacity to measure perceptual and information processing abilities. The taxonomy developed here suggests that tests of this sort will be useful in predicting performance in many, but not all, Navy ratings.

3. The rating taxonomy developed here leads to several testable hypotheses regarding the relative usefulness of several types of predictors in different ratings. An example of the type of hypothesis generated by this taxonomy is presented in Table 9. In general, the taxonomy developed here suggests that the predictive validity and utility of different types of predictors will vary across groups of ratings. More important, the optimum battery of predictors may vary systematically across ratings. For example, validity generalization research suggest that cognitive ability tests will show some level of validity in practically all ratings, but in many ratings (i.e., those in the practical ability and training clusters), cognitive ability tests would not be the best choice for predicting job performance.

**Table 9**  
Predicted Usefulness of Several Types of Predictors

Representative Rating	Cognitive Ability Tests	Psychomotor and Information Processing Tests	Training Measures
MM	Low	High	Moderate
HM	Moderate	Low	High
IS	High	Low	Moderate

4. A predictor-based taxonomy has practical implications for the design and validation of selection and placement tests. For example, a validity study that assesses the usefulness of a new computer-administered information processing test may reach different conclusions if conducted in a sample of Machinist's Mates than if conducted in a sample of Hospital Corpsman. Studies that assess the comparative validity and utility of two different types of predictors might be especially sensitive to the composition of the sample employed. In general, studies that are designed to generalize to the entire enlisted population should include representative of all three of the clusters identified here.

5. Expert judgment provides a reliable method for determining ability, training, and experience requirements for Navy ratings. Expert judges had little difficulty comprehending the tasks presented to them, and were able to discriminate between ratings in terms of their ability requirements. Expert judges had little difficulty comprehending the tasks presented to them, and were able to discriminate between ratings in terms of their ability requirements. Expert judges understood the Fleishman ability taxonomy and were



able to make consistent judgments in the policy capturing task (average multiple  $R$ , summing across judges, was in excess of .90). Experts showed acceptable levels of inter-rater agreement, and the outcomes of the two expert judgment tasks were compatible with data from validation research and task analyses.

6. Task analysis and occupational ability pattern analysis are not useful for determining job requirements that are common to many Navy ratings. The majority of the task data supplied for each rating was unique to that rating. Occupational ability patterns provided a potential basis for grouping jobs, but on close analysis patterns do not provide sufficient discrimination to allow the grouping of ratings. Occupational ability patterns tended to be quite flat, and were highly similar across ratings. One reason for this is that most occupational ability patterns represented the mean of several civilian job requirement patterns. It is generally the case that averaging over several profile tends to produce a single flat profile for each job; this same phenomenon was observed in the present study.

7. Future classification of Navy ratings should take into account personality and interpersonal relations dimensions that are related to job success as well as ability, training, and experience variables. This conclusion is based on our field interview with subject-matter experts. Personality dimensions such as flexibility, stress tolerance, and initiative were cited by many experts as key determinants of performance. Although data from the field interviews do not allow detailed analyses, differences between ratings were apparent in the types of personality dimensions most frequently cited. For example, in ratings that involved customer service (e.g., SH, PC), ability to deal effectively with interpersonal stress was cited as important, whereas, in ratings that involved independent decision making (e.g., AC), mental flexibility was cited as most important. Subject-matter experts agreed that personality and attitude were often more important than ability in determining success or failure on the job.

8. The rating is an appropriate unit of analysis for this type of taxonomy. Within ratings, individual jobs can vary considerably. For example, the rating IS may contain many different types of specialists. Nevertheless, there is enough broad similarity in function within each rating, and enough difference between ratings to make a taxonomy of ratings both plausible and useful.

## RECOMMENDATIONS

1. The methods developed here should be applied to the remaining Navy ratings. Specifically, expert judgments regarding the ability, training, and experience requirements of each rating should be solicited. Our experience in collecting data for this project suggests that 3 to 5 experts should be sampled in each rating, and that it may be possible to conduct at least some of this data collection by mail rather than conducting field interviews for every rating. Where field interviews are done, it is possible to deal with groups of practically any size and composition, since most of the data are collected using relatively simple questionnaires.

2. Predictions that are generated on the basis of the taxonomy presented here should be tested. As adequate operational job performance measures become available in different ratings, it will be possible to assess the predictive power of the taxonomy developed here. In particular, research on the comparative validity of different predictors in different ratings is recommended. Although the taxonomy developed here does allow us to predict the rank-order of the usefulness of predictors in different ratings,



the data do not allow us to predict the size of the effect. Thus, it is not currently possible to provide explicit estimates of the actual level of different predictors in different ratings.

3. Alternatives to the policy capturing task used in the present study should be explored. In particular, the feasibility of obtaining direct estimates of the importance of intelligence, training, experiences, and perceptual motor ability should be determined; such a task would be considerably simpler than the current policy capturing task, and would greatly facilitate the use of surveys rather than interviews in collecting data on the remaining ratings.

4. Personality variables and interpersonal skills associated with successful job performance in different Navy ratings should be studied. At present, little is known about the extent to which personality variables affect job performance in the Navy, or about the particular variables that are most strongly related to job performance. The addition of personality and interpersonal skill information may allow the development of hierarchical taxonomies, in which jobs with similar ability requirements can be differentiated in terms of their personality and interpersonal requirements.

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**APPENDIX A**  
**ABILITY RATING QUESTIONNAIRE**

## QUESTIONNAIRE 1

### Instructions.

A set of abilities have been listed below. We are interested in your judgments about the importance of these abilities for successful performance in jobs similar to yours. In making these judgments think about what E 4's and E 5's in your rating do. Think about an individual very low on that ability. What would be the consequences for successful job performance? Use the following scale:

1	2	3	4	5
very minimal effect on performance	small effect on performance	noticeable effect on performance	large effect on performance	very substantial effect on performance

Use the blank provided to the right of each ability description for your response.

For example, if a radio announcer is low on the ability of oral expression, the consequences for successful performance on the job might be very substantial. Thus, a 5 would be put in the blank next to oral expression. Conversely, if a radio announcer is low on the ability of mathematical reasoning, the consequences for successful job performance might be very minimal, and a 1 would be put in the blank for mathematical reasoning. When answering, keep in mind that we are most interested in performance at the E4 and E5 level.



1. Oral Comprehension. The ability to understand spoken English words and sentences. \_\_\_\_\_
2. Written Comprehension. The ability to understand written English words and sentences. \_\_\_\_\_
3. Oral Expression. The ability to use English words or sentences in speaking so others will understand. \_\_\_\_\_
4. Written Expression. The ability to use English words or sentences in writing so others will understand. \_\_\_\_\_
5. Memorization. The ability to remember information, such as words, numbers, pictures, and procedures. \_\_\_\_\_
6. Problem Sensitivity. The ability to tell when something is wrong or is likely to go wrong. It includes being able to identify the whole problem as well as the elements of the problem. \_\_\_\_\_
7. Mathematical Reasoning. The ability to understand and organize a problem and then to select a mathematical method or formula to solve the problem. It encompasses reasoning through mathematical problems to determine appropriate operation that can be performed to solve problems. The actual manipulation of numbers is not included in this ability. \_\_\_\_\_
8. Number Facility. The degree to which adding, subtracting, multiplying, and dividing can be done quickly and correctly, These can be steps in other operations like finding percentages and taking square roots. \_\_\_\_\_
9. Deductive Reasoning. The ability to apply general rules to specific problems to come up with logical answers. It involves deciding if an answer makes sense. \_\_\_\_\_

10. Inductive Reasoning. The ability to combine separate pieces of information, or specific answers to problems, to form general rules or conclusions. It involves the ability to think of possible reasons for why things go together. \_\_\_\_\_
11. Speed of Closure. The degree to which different pieces of information can be combined and organized into one meaningful pattern quickly. It is not known beforehand what the pattern will be. The material may be visual or auditory. \_\_\_\_\_
12. Flexibility of Closure. The ability to identify or detect a known pattern (like a figure, word, or object) that is hidden in other material. \_\_\_\_\_
13. Spatial Orientation. The ability to tell where you are in relation to the location of some object or to tell where the object is in relation to you. \_\_\_\_\_
14. Visualization. The ability to imagine how something will look when it is moved around or when its parts are moved or rearranged. It requires the forming of mental images of how patterns or objects would look after certain changes, such as unfolding or rotation. \_\_\_\_\_
15. Perceptual Speed. The degree to which one can compare letters, numbers, objects, pictures, or patterns, quickly and accurately. This ability also includes comparing a presented object with a remembered object. \_\_\_\_\_

16. Control Precision. The ability to move controls of a machine or vehicle. This involves the degree to which these controls can be moved quickly and repeatedly to exact positions. \_\_\_\_\_
17. Selective Attention. The ability to concentrate on a task one is doing. This ability involves concentrating while performing a boring task and not being distracted. \_\_\_\_\_
18. Time Sharing. The ability to shift back and forth between two or more sources of information. \_\_\_\_\_
19. Auditory Attention. The ability to focus on a single source of auditory information in the presence of other distraction and irrelevant auditory stimuli. \_\_\_\_\_
20. Speech Hearing. The ability to learn and understand the speech of another person. \_\_\_\_\_
21. Speech Clarity. The ability to communicate orally in a clear fashion understandable to a listener. \_\_\_\_\_

**APPENDIX B**  
**POLICY CAPTURING QUESTIONNAIRE**

## QUESTIONNAIRE 2

### Instructions.

Different abilities and characteristics are important for succeeding in different ratings in the Navy. We will describe 50 individuals in terms of four of their characteristics:

General Intelligence. The ability to reason, to learn, and to choose appropriate courses of action.

Performance in Training. The performance in Navy training courses that are specifically related to an individual's current job.

Relevant Work Experience. The extent to which prior civilian and Navy jobs involved skills or knowledge relevant to the individual's current job.

Perceptual and Motor Skills. The ability to make quick, accurate responses to small events in the environment, such as an indicator light or a blip on a radar screen.

Your task is to predict how successful each individual might be in your rating, given what you know about these four characteristics. For example, how successful do you think a person would be in your rating if that person had done very well in training, but had very poor perceptual and motor skills?



We will describe each one of these four characteristics in terms ranging from very low to very high. Definitions of these terms are given below:

Very Low - bottom 10% in the Navy

Low - 10<sup>th</sup> - 30<sup>th</sup> percentile

Average - middle 40% of the Navy (30<sup>th</sup> - 70<sup>th</sup> percentile)

High - 70<sup>th</sup> - 90<sup>th</sup> percentile

Very High - top 10% of the Navy

We will ask you to read each description, and then rate that individual's chance of performing successfully on the job using the scale below.

1	2	3	4	5
almost certain to fail	likely to fail	average chance of success on the job	likely to succeed	almost certain to succeed

Please remember that we are most interested in performance at the E4 and E5 level.

**Individual # 1**

General Intelligence - Very Low

Performance in Training - High

Relevant Work Experience - Low

Perceptual and Motor Skills - High

How likely is it that this person will succeed? \_\_\_\_\_

**Individual # 2**

General Intelligence - Average

Performance in Training - High

Relevant Work Experience - High

Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

**Individual # 3**

General Intelligence - High

Performance in Training - Low

Relevant Work Experience - Very High

Perceptual and Motor Skills - Very High

How likely is it that this person will succeed? \_\_\_\_\_

**Individual # 4**

General Intelligence - Very High

Performance in Training - Average

Relevant Work Experience - Average

Perceptual and Motor Skills - Low

How likely is it that this person will succeed? \_\_\_\_\_

**Individual # 5**

General Intelligence - Average

Performance in Training - High

Relevant Work Experience - High

Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 6

General Intelligence . - High  
Performance in Training - Average  
Relevant Work Experience - Very Low  
Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 7

General Intelligence - Very Low  
Performance in Training - Very High  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 8

General Intelligence - High  
Performance in Training - Very High  
Relevant Work Experience - Low  
Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 9

General Intelligence - Average  
Performance in Training - High  
Relevant Work Experience - Average  
Perceptual and Motor Skills - High

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 10

General Intelligence - Average  
Performance in Training - Very High  
Relevant Work Experience - Very High  
Perceptual and Motor Skills - Very High

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 11

General Intelligence . - Low  
Performance in Training - Average  
Relevant Work Experience - Low  
Perceptual and Motor Skills - Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 12

General Intelligence - Average  
Performance in Training - High  
Relevant Work Experience - High  
Perceptual and Motor Skills - High

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 13

General Intelligence - Very High  
Performance in Training - Average  
Relevant Work Experience - Low  
Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 14

General Intelligence - High  
Performance in Training - Very Low  
Relevant Work Experience - Very Low  
Perceptual and Motor Skills - Very Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 15

General Intelligence - High  
Performance in Training - Low  
Relevant Work Experience - Very High  
Perceptual and Motor Skills - Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 16

General Intelligence - Low  
Performance in Training - Low  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 17

General Intelligence - Average  
Performance in Training - High  
Relevant Work Experience - Average  
Perceptual and Motor Skills - High

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 18

General Intelligence - Low  
Performance in Training - Low  
Relevant Work Experience - High  
Perceptual and Motor Skills - High

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 19

General Intelligence - High  
Performance in Training - Low  
Relevant Work Experience - High  
Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 20

General Intelligence - Average  
Performance in Training - Average  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_



Individual #21

General Intelligence -Low  
Performance in Training -Average  
Relevant Work Experience -High  
Perceptual and Motor Skills -Very High

How likely is it that this person will succeed? \_\_\_\_\_

Individual #22

General Intelligence -Average  
Performance in Training -Average  
Relevant Work Experience -Low  
Perceptual and Motor Skills -Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual #23

General Intelligence -Low  
Performance in Training -High  
Relevant Work Experience -Low  
Perceptual and Motor Skills -Very Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual #24

General Intelligence -High  
Performance in Training -Very Low  
Relevant Work Experience -Average  
Perceptual and Motor Skills -High

How likely is it that this person will succeed? \_\_\_\_\_

Individual #25

General Intelligence -Low  
Performance in Training -Low  
Relevant Work Experience -High  
Perceptual and Motor Skills -High

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 26

General Intelligence - Very Low  
Performance in Training - Average  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 27

General Intelligence - Very High  
Performance in Training - High  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Very Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 28

General Intelligence - Very Low  
Performance in Training - High  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 29

General Intelligence - Average  
Performance in Training - Average  
Relevant Work Experience - High  
Perceptual and Motor Skills - Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 30

General Intelligence - High  
Performance in Training - Low  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Low

How likely is it that this person will succeed? \_\_\_\_\_

**Individual # 31**

General Intelligence - Very High

Performance in Training - Low

Relevant Work Experience - Average

Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

**Individual # 32**

General Intelligence - Low

Performance in Training - Average

Relevant Work Experience - Average

Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

**Individual # 33**

General Intelligence - Average

Performance in Training - High

Relevant Work Experience - Very High

Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

**Individual # 34**

General Intelligence - Low

Performance in Training - High

Relevant Work Experience - High

Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

**Individual # 35**

General Intelligence - Average

Performance in Training - Average

Relevant Work Experience - Low

Perceptual and Motor Skills - High

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 36

General Intelligence -Average  
Performance in Training -Very Low  
Relevant Work Experience -Average  
Perceptual and Motor Skills -Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 37

General Intelligence -Average  
Performance in Training -Very High  
Relevant Work Experience -High  
Perceptual and Motor Skills -Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 38

General Intelligence -Average  
Performance in Training -Low  
Relevant Work Experience -Low  
Perceptual and Motor Skills -Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 39

General Intelligence -Average  
Performance in Training -Average  
Relevant Work Experience -Average  
Perceptual and Motor Skills -Very Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 40

General Intelligence -High  
Performance in Training -Average  
Relevant Work Experience -Very Low  
Perceptual and Motor Skills -High

How likely is it that this person will succeed? \_\_\_\_\_



Individual # 41

General Intelligence - High  
Performance in Training - Average  
Relevant Work Experience - Average  
Perceptual and Motor Skills - High

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 42

General Intelligence - Average  
Performance in Training - Average  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 43

General Intelligence - Low  
Performance in Training - Average  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 44

General Intelligence - Low  
Performance in Training - Low  
Relevant Work Experience - Low  
Perceptual and Motor Skills - Very High

How likely is it that this person will succeed? \_\_\_\_\_

Individual # 45

General Intelligence - Average  
Performance in Training - Average  
Relevant Work Experience - Average  
Perceptual and Motor Skills - Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual #46

General Intelligence -Low  
Performance in Training -Average  
Relevant Work Experience -High  
Perceptual and Motor Skills -Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual #47

General Intelligence -Average  
Performance in Training -Average  
Relevant Work Experience -Average  
Perceptual and Motor Skills -Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual #48

General Intelligence -Average  
Performance in Training -Low  
Relevant Work Experience -Low  
Perceptual and Motor Skills -Average

How likely is it that this person will succeed? \_\_\_\_\_

Individual #49

General Intelligence -Average  
Performance in Training -Average  
Relevant Work Experience -Low  
Perceptual and Motor Skills -Low

How likely is it that this person will succeed? \_\_\_\_\_

Individual #50

General Intelligence -High  
Performance in Training -Very Low  
Relevant Work Experience -Very Low  
Perceptual and Motor Skills -High

How likely is it that this person will succeed? \_\_\_\_\_

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